

## ON A COLLECTION OF FISH AND PRAWNS FROM THE EAST ALLIGATOR ESTUARY, KAKADU NATIONAL PARK, AUSTRALIA

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### ABSTRACT

52 species of fish and 16 species of prawns were collected from estuarine and inshore waters of the East Alligator River and Murganella Creek in Kakadu National Park by beam trawl between September 1978 and May 1979. Sciaenids dominated the fish fauna, with *Johnius novaeguinae* being the most abundant species, followed by the gobioid *Brachyamblyopus rubristriatus*, another sciaenid *Johnius weberi*, and the polynemid *Polynemus verekeri*. The prawns were dominated by a sergestid, *Acetes* sp., and a penaeid, *Atyppopenaeus formosus*. Four species of fish are new records for Australia: *Ilisha megaloptera*, *Damiodes quadrifasciatus*, *Johnius macropterus* and *Johnius novaeguinae*. Four species do not appear to have been described: *Leiognathus* sp. 1; two sciaenids and a goby. The fish in this region are estuarine and inshore species typical of tropical Indo-Pacific waters with high turbidity and fluctuating salinities and, despite the restrictions of beam trawl sampling, include a number of species that occur in inshore waters of the Gulf of Carpentaria as well as tidal swamp areas near Darwin.

**KEYWORDS:** Estuaries, surveys, trawl, fish, crustacea, species distribution, tropical Australia

### INTRODUCTION

The Ranger and Narbarlek uranium mines are located on tributaries of the East Alligator River system within the Kakadu National Park. The Alligator Rivers Region Research Institute was established under the Environmental Protection Act 1978 to conduct, coordinate and integrate research to ensure this region would, in future, be protected from any harmful effects of mining and processing of uranium ore (Anonymous 1985). Prior to this, various components of the environment and biota had been surveyed, including the fish communities of the upper freshwater habitats of the East Alligator River and Cooper Creek (Midgley 1974). However, no surveys had been made of the fish and crustacean fauna near the mouth or on the adjacent mudflats of the East Alligator River. A beam trawl survey of the fish and prawns was initiated by the CSIRO Division of Fisheries and conducted monthly from September 1978 to May 1979 as part of a larger study monitoring the reproductive cycle of barramundi, *Lates calcarifer* (Davis 1985). This paper presents informa-

tion on the species collected by the beam trawl, and outlines some general patterns in their distribution and abundance prior to uranium mining in the region.

### METHODS

Collections were made each month between September 1978 and May 1979 at seven stations near the mouth of the East Alligator River and along the mudflats of Murganella and Saltwater Creeks to the north (Fig. 1) by using a roller beam trawl (described in Young 1975) towed from a dinghy, along the bottom against the direction of tidal flow. The specimens were washed and preserved in 5% v/v formaldehyde. Specimens were identified using keys or sent to specialists. Institutional abbreviations are as follows: CSIRO, CSIRO ISR Munro collection, Hobart; AMS, Australian Museum, Sydney.

### RESULTS AND DISCUSSION

A total of 52 species of fish and 16 species of prawns were identified from 99 tows (Table 1). In addition to the gobies listed, there were

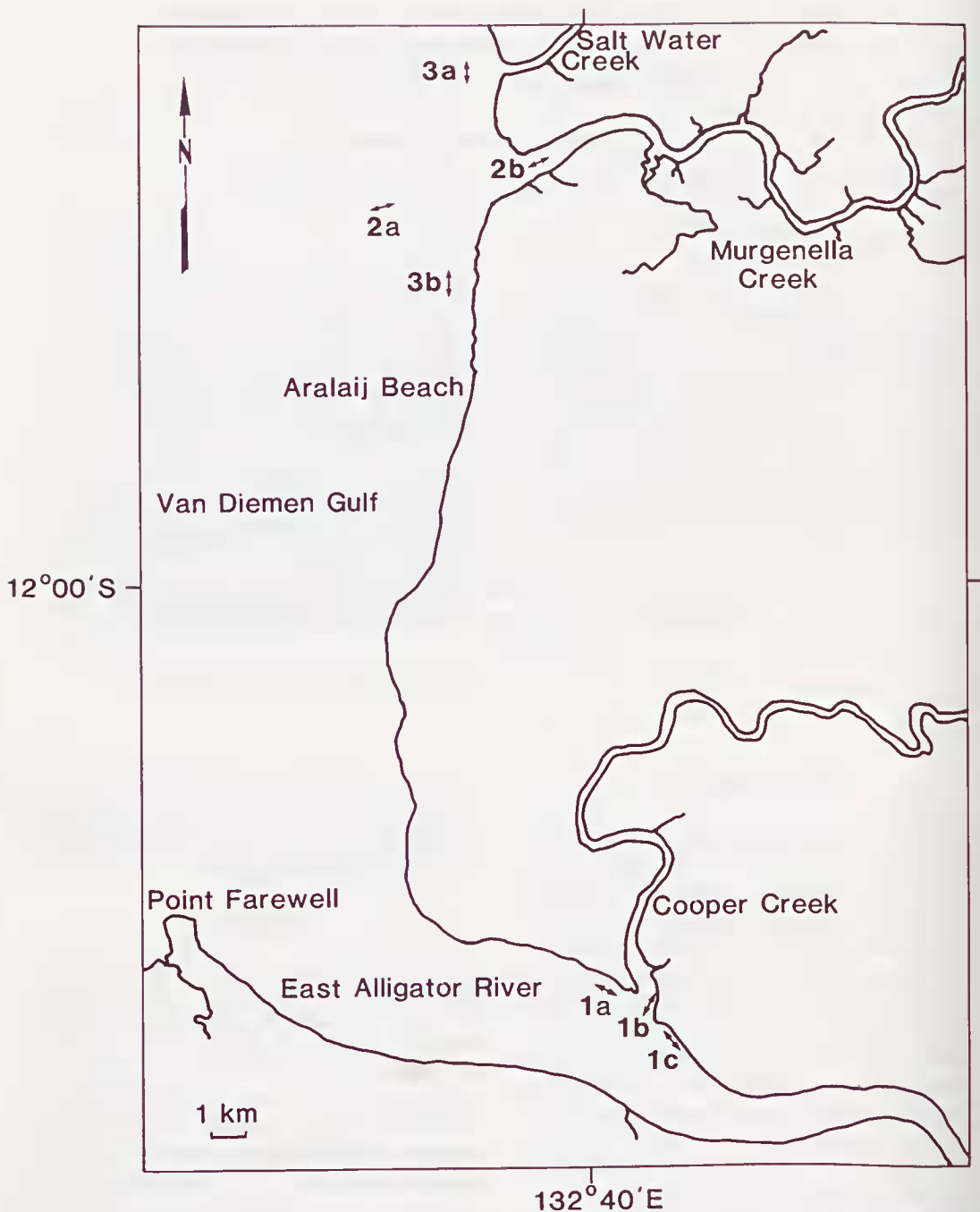


Fig. 1. Inshore and estuarine regions of East Alligator River and Murganella Creek, Northern Territory, showing beam trawl stations and sites. Direction of tows indicated by arrows.

16 other species of gobies, mostly represented by single specimens, and being small juveniles could not be identified. Prawns dominated trawl samples, with *Acetes* sp. 1 and *Atyppopenaeus formosus* being in particularly large numbers. The fish fauna was less abundant than the prawns but far more diverse. The

sciaenid *Johnius novaeguinae*, was the dominant species followed by the gobioid *Brachyamblyopus rubristriatus*, another sciaenid *Johnius weberi*, and the polynemid *Polynemus verekeri*.

All prawns identified to species have previously been recorded from the Northern Terri-

tory. Four species of fish are new records for Australia: *Ilisha megaloptera*, *Datniodes quadrifasciatus*, *Johnius macropterus* and *Gobiopsis macrostoma*. A further 6 species are new records for the Northern Territory: *Setipinna godvari*, *Cheroscorpaena tridactyla*, *Alepes melanoptera*, *Austronibea oedogenys*, *Otolithes ruber* and *Johnius novaeguinae*. Four species which do not appear to have been described have been deposited in the following institutions: *Leiognathus* sp. 1 (CSIRO B1988-1989); Sciaenid sp. 1 (CSIRO

B1986) - considered to be an undescribed species of *Nibeini* close to *Daysciaena* (R. Mackay, personal communication), Sciaenid sp. 2 (CSIRO B1987) and Gobiid sp. 1 (AMS I. 22479.001-I.22482.001) - which is probably an undescribed genus (D. Hoese, personal communication).

All sciaenids, except two specimens of *Austronibea oedogenys*, were captured in the deeper water of the river channels (sites 1 and 2), rather than on the mudflats (site 3) and most were caught during January and Febru-

**Table 1.** List of prawn and fish species collected (by family and genus) together with length range (carapace length for prawns and standard length for fish, - denotes not measured) and abundance (rare<10; common, 10-100; abundant>100)

Taxon	Length range (mm)	Abundance	Taxon	Length range (mm)	Abundance
<b>PRAWNS</b>			<b>Leiognathidae</b>		
<b>Penaeidae</b>			<i>Leiognathus</i> sp. 1	7-20	common
<i>Atypopenaeus bicornis</i> Racek and Dall, 1965	1-21	abundant	<i>Leiognathus equulus</i> Forskal, 1775	8-12	rare
<i>Atypopenaeus formosus</i> Dall, 1957	1-16	abundant	<b>Lobotidae</b>		
<i>Metapenaeus eboracensis</i> Dall, 1957	6-26	common	<i>Datniodes quadrifasciatus</i> (Sevastianov, 1809)	11-67	rare
<i>Metapenaeus ensis</i> (de Haan, 1850)	16	rare	<b>Sciaenidae</b>		
<i>Metapenaeus demani</i> (Roux, 1922)	9-23	common	<i>Austronibea oedogenys</i> Trewavas, 1977	17-52	common
<i>Parapenaeopsis sculptilis</i> (Heller, 1862)	3-29	abundant	<i>Johnius (Johnius) macropterus</i> (Bleeker, 1835)	52	rare
<i>Penaeus merguensis</i> de Man, 1888	13-108	rare	<i>Johnius (Johnius) weberi</i> Hardenberg, 1936	9-57	abundant
<b>Sergestidae</b>			<i>Johnius (Johnieops) novaeguinae</i> (Nichols, 1950)	5-99	abundant
<i>Acetes</i> sp. 1	1-18	abundant	<i>Johnius (Johnieops) vogleri</i> (Bleeker, 1853)	6-46	common
<i>Lucifer</i> sp. 1	1-2	abundant	<i>Nibeia soldado</i> (Lacepede, 1802)	8-52	common
<b>Alpheidae</b>			<i>Otolithes ruber</i> (Schneider, 1801)	7-40	common
<i>Alpheus</i> sp. 1	2-7	rare	Sciaenid sp. 1	15-55	rare
<i>Alpheus</i> sp. 2	2-6	rare	Sciaenid sp. 2	38	rare
<b>Hippolytidae</b>			<b>Scatophagidae</b>		
<i>Hippolytid</i> sp. 1	1-7	common	<i>Selenotoca multifasciata</i> Richardson, 1844	5-6	rare
<i>Hippolytid</i> sp. 2	1-7	common	<b>Mugilidae</b>		
<b>Palaemonidae</b>			<i>Mugilid</i> sp. 1	11	rare
<i>Leander</i> sp. 1	3-6	common	<b>Polynemidae</b>		
<i>Macrobrachium</i> sp. 1	5-20	rare	<i>Polynemus sheridani</i> (Macleay, 1884)	49	rare
<i>Palaemonid</i> sp. 1	2-3	rare	<i>Polynemus verekeri</i> Saville-Kent, 1889	5-84	common
<b>FISH</b>			<b>Callionymidae</b>		
<b>Clupeidae</b>			<i>Callionymid</i> sp. 1	4-7	rare
<i>Escualosa thoracata</i> (Valenciennes, 1847)	14-53	rare	<b>Gobiidae</b>		
<i>Herklotsichthys</i> sp. 1	55	rare	<i>Apocryptodon</i> sp. 1	18	rare
<i>Ilisha megaloptera</i> (Swainson, 1839)	25-55	rare	<i>Boleophthalmus caeruleomaculatus</i> McCulloch and Waite, 1917	10-15	rare
<b>Engraulidae</b>			<i>Drombus</i> sp. 1	5-32	rare
<i>Papuengraulis micropinna</i> Munro, 1964	15-94	common	<i>Gobiopsis macrostoma</i> Steindachner, 1861	10-60	rare
<i>Setipinna godvari</i> Babu Rao, 1961	21-59	common	Gobiid sp. 1	20-30	rare
<i>Stolephorus commersoni</i> Lacepede, 1803	20-43	common	<i>Oxudercus dentatus</i> Eydoux and Souleyet, 1842	13-16	common
<i>Stolephorus indicus</i> van Hasselt, 1823	22-23	common	<i>Periophthalmus</i> sp.	9-10	rare
<i>Thryssa hamiltoni</i> (Gray, 1835)	48	rare	<i>Scartelaos histophorus</i> Cuvier and Valenciennes, 1837	12-14	common
<i>Thryssa kammalensis</i> (Bleeker, 1849)	27-52	common	<i>Brachyamblyopus rubristriatus</i> (Saville-Kent, 1889)	7-150	abundant
<i>Thryssa setirostris</i> (Broussonet, 1782)	25-28	rare	<i>Taenioides jacksoni</i> Smith, 1943	-	Rare
<b>Harpadontidae</b>			<b>Eleotrididae</b>		
<i>Harpadon translucens</i> Saville-Kent, 1889	44-102	rare	<i>Butis</i> sp. 1	-	rare
<b>Ariidae</b>			<b>Kurtidae</b>		
<i>Arius armiger</i> De Vis, 1884	43-70	common	<i>Kurtus gulliveri</i> Castlenau, 1878	6-32	common
<i>Arius berneyi</i> (Whitley, 1941)	88	rare	<b>Trichiuridae</b>		
<b>Syngnathidae</b>			<i>Trichiurus savala</i> Cuvier, 1829	147	rare
<i>Hippichthys parvicarinatus</i> Dawson, 1978	43	rare	<b>Soleidae</b>		
<b>Scorpaenidae</b>			<i>Pardachirus jaubertensis</i> (Rendahl, 1921)	12-65	rare
<i>Cheroscorpaena tridactyla</i> Mees, 1964	6-51	common	<b>Cynoglossidae</b>		
<b>Platycephalidae</b>			<i>Cynoglossus heterolepis</i> Weber, 1910	119	rare
<i>Platycephalid</i> sp. 1	16-19	rare	<i>Cynoglossus maculipinnis</i> (Rendahl, 1921)	33	rare
<b>Serranidae</b>			<i>Paraplagusia guttata</i> (Macleay, 1878)	8-45	rare
<i>Serranid</i> sp. 1	4	rare	<b>Tetraodontidae</b>		
<b>Sillaginidae</b>			<i>Tetraodontid</i> sp. 1 (juveniles)	5-12	rare
<i>Sillago</i> sp. 1	2	rare			
<b>Carangidae</b>					
<i>Alepes melanoptera</i> Swainson, 1839	6-35	common			



ary. Sites 1 and 2 appear to be the nursery area for all the sciaenids and the preferred habitat for the adults of at least the smaller species that are likely to be caught by the beam trawl. Estuaries are important nursery grounds for the larvae and juveniles of many sciaenid species (Cowan and Birdsong 1985). Other species that were more abundant in the deeper water of the river channels than on the shallow mudflats were the prawns *Atypopenaeus bicornis* and *Parapenaeopsis sculptilis*, and the fish *Papuengraulis micropinna*, *Arius armiger*, *Cheroscorpaena tridactyla*, *Alepes melanoptera*, *Polynemus verekeri*, *Brachyamblyopus rubristriatus* and *Kurtus gulliveri*. *Stolephorus commersoni*, *Stolephorus indicus*, *Leiognathus* sp. 1 and *Oxuderces dentatus* were the only species clearly more abundant on the mudflats than in the river channels. *Lucifer* sp. 1 was present in very large numbers but only at sites 1 and 2 and it was absent at these sites in January and February, the months of lowest salinities. Other *Lucifer* species prefer salinities above 15‰ (Franks *et al.* 1972; Huff and Cobb 1979) and salinity probably limits the distribution of *Lucifer* in this study.

The fish fauna of the East Alligator estuary is rather different from that reported for other tropical estuarine areas in Australia. This can be attributed, in part, to the limited size range of fish able to be caught by beam trawl (Young and Wadley 1979). The fish fauna shows little affinity with that of the Dampier Region of North-west Australia (Blaber *et al.* 1985), sharing only 6 of the 165 species found in the latter region. Many of the species in that region occur in waters with low turbidity and constant salinity. The fish in our study area are estuarine and inshore species typical of tropical Indo-Pacific waters with high turbidity and fluctuating salinities. They show a closer affinity to the fish fauna in inshore waters of the Gulf of Carpentaria sharing 24% of the species caught by otter trawl (Rainer and Munro 1982) and the fauna of tidal swamp areas near Darwin (Davis 1988) where 20% of the species caught in tidal traps were also caught in the East Alligator estuary.

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#### REFERENCES

- Anonymous 1985. *Alligator Rivers Region Research Institute Annual Research Summary for 1984-85*. Australian Government Publishing Service: Canberra.
- Blaber, S.J.M., Young, J.W. and Dunning, M.C. 1985. Community structure and zoogeographic affinities of the coastal fishes of the Dampier region of north-western Australia. *Australian Journal of Marine and Freshwater Research* 36:247-266.
- Cowan, J.H. Jr. and Birdsong, R.S. 1985. Seasonal occurrence of larval and juvenile fishes in a Virginia Atlantic Coast estuary with emphasis on drums (Family Sciaenidae). *Estuaries* 8:48-59.
- Davis, T.L.O. 1985. Seasonal changes in gonad maturity, and abundance of larvae and early juveniles of barramundi, *Lates calcarifer* (Bloch), in Van Diemen Gulf and the Gulf of Carpentaria. *Australian Journal of Marine and Freshwater Research* 36:177-190.
- Davis, T.L.O. 1988. Temporal changes in the fish fauna entering a tidal swamp system in tropical Australia. *Environmental Biology of Fishes* 21:161-172.
- Franks, J.S., Christmas, J.Y., Siler, W.L., Combs, R., Waller, R. and Burns, C. 1972. A study of nektonic and benthic faunas of the shallow Gulf of Mexico off the State of Mississippi as related to some physical, chemical, and geological factors. *Gulf Research Report* 4(1):1-148.
- Huff, J.A. and Cobb, S.P. 1979. Penaeoid and sergestoid shrimps (Crustacea:Decapoda). *Memoirs of the Hourglass Crustaceans* 5(4):1-102.
- Midgley, S.H. 1974. *Alligator Rivers region environmental fact finding study. Fresh water fish*

- inventory. Department of the Northern Territory Report. 34 pp.
- Rainer, S.F. and Munro, I.S.R. 1982. Demersal fish and cephalopod communities of an unexploited coastal environment in northern Australia. *Australian Journal of Marine and Freshwater Research* **33**:1039-1055.
- Young, P.C. 1975. Preliminary observations on the environment and biology of juvenile king prawns (*Penaeus plebejus*) in Moreton Bay, Queensland. In: P.C. Young (ed.) *Australian National Prawn Seminar, Maroochydore*. 1973:18-36. Australian Government Publishing Service: Canberra.
- Young, P.C. and Wadley, V.A. 1979. Distribution of shallow-water epibenthic macrofauna in Moreton Bay, Queensland, Australia. *Marine Biology* **53**:83-97.

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